**How to Make Your Chores Easier**

Parents often assign you chores to do...cut the grass, pick up the leaves on the lawn, get the snow off of the driveway, put that heavy science trophy you won on the top shelf of the display case.   
 So if you have to do these things, how can you make them easier?

Machines are devices that make work easier to do. The two main types of machines are simple and compound. Simple machines can do the work with just one movement of the machine. There are six basic types: levers, wheel and axles, pulleys, inclines planes, screws, and wedges.  
Compound machines require more than one movement to do the work. They are made of 2 or more simple machines that work together.

Let’s focus on simple machines. Like all machines, they make work easier to do. However, they never change the amount of work done. They are essentially energy transfer devices.

|  |  |
| --- | --- |
| Work YOU DO on your end | Work the MACHINE DOES on the object |
| Push your end of a see-saw down | Object on other end moves up instead of you having to lift it straight up. |
| Pull down on the rope of a pulley | Flag moves up the flagpole without you having to climb up the pole to get it there. |
| Slide a heavy box up a ramp into the back of a truck | Box gets into the truck without you having to lift it straight up. |
| Walk up a gently sloped curving mountain road to get to the top. | You get to the top without having to walk straight up a steep slope. |
| Drive an ax into a piece of wood. | Wood splits apart without you trying to do it with your bare hands. |
| Turn the steering wheel of a car | Car turns without you having to pick it up and turn it. |

So if machines make work easier, how do they do it? Remember that work, scientifically speaking, is using a force to move something a distance.

Work = Force x Distance

The work you put into the machines is called the input work (Win). The work the machine does is called the output work (Wout).

Since machines never change the amount of work done then:

Win = Wout

But we still haven’t answered how machines make work easier…

The ways a machine makes work easier is by changing the direction and/or the size of the force you put into the machine. The amount of force you put into a machine is called the effort force (Fe). The amount of force the machine needs to move something is called the resistance force (Fr).

So let’s replace the W (for work) with F (force ) x D (distance).

Win = Wout becomes:

Fe x De = Fr x Dr

Win = the work you do on the machine  
Fe = the force you have to put into the machine  
De = the distance you have to move that part of the machine

Wout = the work the machine does to move the object  
Fr = the force the machine must use to move the object  
Dr = the distance the machine moves the object

Put in words…

The force you put in times the distance you move a part of the machine equals the force the machine gives you times the distance the machine moves the object.

Since machines can’t make more work than the work that is put into them, there has to be a trade off.

Example #1 -

Fe x De = Fr x Dr

You don’t use a lot of force but you have to move a part of the machine a long distance. In return the machine gives you a lot of force but doesn’t move the object very far.

Example #2 –

Fe x De = Fr x Dr

You have to use a lot of force but only for a short distance. In return the machine gives you a lot of distance (so you get speed) but doesn’t use a lot of force (so heavy things won’t move).

Example #3 -

Fe (you pull down) x De = Fr (object goes up) x Dr

The force or distance you put may not get smaller or bigger so the force  
 or distance the machine gives you may not get smaller or bigger.   
 The machine changes the direction of your force…you pull down, object   
 goes up.